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SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER	
CHENG, PETER L	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/686,817	ARAI, YOSHIFUMI	
	Examiner	**Art Unit**	
	PETER L. CHENG	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 July 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,7-9,11,12 and 18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,7,8,9,11,12,18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 July 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7/25/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on **7/10/2008** has been entered.

2. A “red-lined” copy of the amended specification, as noted in applicant’s remarks, does not appear to have been received. This substitute specification may be filed with the response to this office action.

Claim Objections

3. Claim 1 is objected to because of the following informalities:

- **Line 9: “said plurality of ink quantities of inks”** lacks antecedent basis; it is assumed that this should be **said ink quantities of inks**;

- **Lines 18 - 19:** for clarity, suggest replacing **the number of patches in a low-lightness range** with **a number of patches in a low-lightness range**;

- **Line 19:** for clarity, suggest replacing **the number of patches in a high-lightness range** with **a number of patches in a high-lightness range**;

- **Line 38:** for clarity, suggest replacing **the count of dots** with **a count of dots**;

4. Claim 2 is objected to because of the following informalities:

- **Line 2:** suggest replacing **the total number of gradations** with **a total number of gradations**;

- **Line 3:** suggest replacing **the range of values** with **a range of values**;

- **Line 3: "said ink recording rate"** lacks antecedent basis;

5. Claim 7 is objected to because of the following informalities:

- **Line 6:** it is assumed that applicant intended to cite **on the another image device** instead of **on the image device**;

6. Claim 11 is objected to because of the following informalities:

- **Line 5:** per **claim 11, line 1**, it is assumed that applicant intended to cite **generated based on** instead of **created based on**;

- **Line 7: "said plurality of ink quantities of inks"** lacks antecedent basis; it is assumed that this should be **said ink quantities of inks**;

7. Claim 12 is objected to because of the following informalities:

- **Line 1:** it is assumed that applicant intended to cite **data generating method** instead of **data creating method**;

- **Line 3:** for clarity, suggest replacing **the total number of gradations** with **<u>a</u> total number of gradations**;

- **Line 3:** for clarity, suggest replacing **the range of value** with **<u>a</u> range of value<u>s</u>**;

- **Line 3:** for clarity, suggest replacing **of ink recording rate** with **of <u>an</u> ink recording rate**;

8. Claim 18 is objected to because of the following informalities:

- **Line 2:** it is assumed that applicant intended to cite **generated** instead of **created**;

- **Lines 2 - 4:** as with **claim 7**, did applicant intend to delete lines with **which defines a correspondence between … used in another image device**?;

- **Line 6:** it is assumed that applicant intended to cite **on the <u>another</u> image device** instead of **on the image device**;

Appropriate correction is required.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 1, 2, 7, 8, 9, 11, 12 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **JACOBS [US Patent 5,481,655]** in view of **COWAN [US Patent Application 2003/0063299 A1]**, **ALLEN [US Patent Application 2002/0024687 A1]** and **NEWMAN [US Patent 6,023,351]**.

As for claim 1, JACOBS teaches a color conversion table generating method wherein a plurality of patches outputted from a printing device **[Fig. 2** color patches **32]**

are subjected to color measuring **[Fig. 2** spectrophotometer **36]**

and a color conversion table **[Fig. 6** custom ink table **74]**

which defines a correspondence between color component values used in another image device **[Fig. 6** monitor model **22]**

and ink value data corresponding to ink quantities of inks used in the printing device **[Fig. 6** master ink table **70]**

is generated based on a result of the color measuring, the method comprising:

creating patch data which specifies said plurality of ink quantities of inks with said ink value data ~~patches~~

[“The printing device 12 receives a plurality of stepped ink values, such as CMY values, thereby to produce a collection 30 of color patches 32”; **col. 5, lines 33 - 36];**

<u>printing said plurality of patches after</u> performing half tone processing where <u>said</u> patch data is input and transformed into half tone image data which indicates a presence or absence of ink dots;

and generating said color conversion table based on color measuring data obtained by <u>said</u> color measuring <u>of said plurality of printed patches</u>
[“a spectrophotometer 36 … is utilized to measure the color value, in the selected colorimetric color coordinate system, of each color patch 32”; **col. 5, lines 47 - 51],**

wherein
<u>said patch data are so defined as to increase the number of patches in a low-lightness range than the number of patches in a high-lightness range by a first gamma correction process so that interpolation can be carried out with high accuracy in the low-lightness range;</u>

said ink value data is defined so <u>as to decrease an ink quantity change rate in the high-lightness range than in the low-lightness range by a second</u>

gamma correction process so that resolution in the high-lightness range can be more enhanced than in the low-lightness range;

and said half tone processing, which represents gradations by a count of dots recorded per unit area, adjusts the count of dots, while taking into account a fractional portion, when an inverse gamma correction is applied to said ink value data, the inverse gamma correction corresponding to the second gamma correction

However, JACOBS does not teach

printing said plurality of patches after performing half tone processing where ~~the~~ said patch data is input and transformed into half tone image data which indicates a presence or absence of ink dots;

wherein

said patch data are so defined as to increase the number of patches in a low-lightness range than the number of patches in a high-lightness range by a first gamma correction process so that interpolation can be carried out with high accuracy in the low-lightness range;

said ink value data is defined so as to decrease an ink quantity change rate in the high-lightness range than in the low-lightness range by a second

gamma correction process so that resolution in the high-lightness range can be more enhanced than in the low-lightness range;

and said half tone processing, which represents gradations by a count of dots recorded per unit area, adjusts the count of dots, while taking into account a fractional portion, when an inverse gamma correction is applied to said ink value data, the inverse gamma correction corresponding to the second gamma correction

COWAN teaches a color calibration method. As shown in **Fig. 4**, COWAN teaches a method for linearizing an input color value (e.g., for cyan, magenta, yellow or black colorants) and cites, “applying correction to the relationship represented by curve 402 has the effect of reshaping curve 402 so that it more closely follows a linear relationship between the chroma value and the color value”; **page 4, paragraph 34, lines 1 – 4.** With respect to **Fig. 5A,** COWAN teaches a color calibration method for calibrating secondary colors which are combinations of primary colors (e.g., yellow and cyan, or yellow and magenta) in which a “hue gradient” (**page 5, paragraph 43, line 3**) is produced by “using a variable quantity of yellow colorant” (**page 5, paragraph 43, lines 5 – 6**) corresponding to “*color values ranging from 0 on the left side to 255 on the right side*”; **page 5, paragraph 43, lines 8 – 9.** COWAN further teaches that a “halftoning operation may be performed upon the color values of the color planes to generate halftone data for the image. The halftone data includes binary data specifying for each

of the pixels in each of the color planes whether colorant for that plane will be placed onto the pixel"; **page 2, paragraph 25, lines 7 – 12.**

That is, COWAN teaches the following limitation:

> ***printing said plurality of patches after** performing half tone processing where ~~the~~ said patch data is input and transformed into half tone image data which indicates a presence or absence of ink dots;*

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of COWAN with those of JACOBS and *print the plurality of patches after performing halftone processing* so that fine hue gradations could be produced and measured.

With respect to **Fig. 4**, COWAN teaches the construction of a "first gamma correction process" which "re-maps color values" and cites, "to perform the re-mapping, the color value associated with point 408 is re-mapped, in the table for the corresponding primary color, with the color value associated with point 410. As a result, an input of the color value associated with point 408 is, through re-mapping in the table, replaced by the color value associated with point 410. This re-mapping occurs over the range of chroma values present on curve 406"; **page 4, paragraph 34, lines 28 – 35.**

Although not shown in **Fig. 4**, the "re-mapping" produces a "first gamma correction" curve which would appear symmetrical to curve 402 with respect to curve 406. Although not relied upon for this rejection, this "first gamma correction" curve would have the shape of a "cut-back curve" as shown in **Fig. 7** of **US Patent 5,953,498** to **SAMWORTH**. The characteristic shape of this "first gamma correction" curve has a gentle slope for small color values (i.e., in the high lightness range) and a steeper slope for larger color values (i.e., in the low lightness range).

One of ordinary skill in the art at the time the invention was made would recognize that because of the steeper slope in the low lightness range, "interpolation accuracy" would decrease.

NEWMAN addresses this concern in teaching that the process of supplementing a color conversion table with additional points is well-known in the art. For example, NEWMAN teaches that "certain regions of a device's color space are critical in the sense that good color reproduction is required (such as for flesh tones), or in the sense that large non-linearities occur even with small changes in device color coordinates. For such regions, it is desired to obtain more color patches by decreasing the interval between samples, so as to obtain greater color accuracy and fidelity in these critical regions"; **col. 1, lines 36 – 43.** NEWMAN cites a prior invention that adds data points "in regions of local non-linearities" to "a look-up table based on empirically measured colors together with calculated colors that have not been measured"; **col. 1, lines 55 – 58.**

That is, regarding the following limitation, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of NEWMAN with those of COWAN and JACOBS to "*increase the number of patches in a low-lightness range than the number of patches in a high lightness range*" after a "*first gamma correction process*" so "*that interpolation can be carried out with high accuracy in the low-lightness range*".

> ***wherein said patch data are so defined as to increase the number of patches in a low-lightness range than the number of patches in a high-lightness range by a first gamma correction process so that interpolation can be carried out with high accuracy in the low-lightness range*;**

With respect to the "re-mapping" noted above, COWAN further teaches that after correcting for possible saturation (**page 4, paragraph 36, lines 1 - 10**), "each of the integer color values is assigned to correspond to the ejection of the number of drops (or fractional exposure of pixels on the photoconductor) necessary to result in a chroma value that lies closer to the line that connects the minimum chroma value and the chroma value at the maximum color value. This mapping is used to generate a table that includes pairs of values specifying the *number of drops of ink* (*or fractional exposure of pixels*) that are to be ejected for each color value, for color values ranging from 0 to 255"; **page 4, paragraph 36, lines 15 - 25.**

That is, COWAN teaches that there is a "mapping" between "color values" and either "number of drops of ink" or "fractional exposure of pixels". As noted earlier, COWAN teaches that, in the case of an inkjet printer, the number of drops of ink is determined by a *halftoning operation*.

As noted, the "first gamma correction" curve with a "gentler slope" in the high lightness range and a steeper slope in the low lightness range, results in "*decreasing an ink quantity change rate in the high lightness range (i.e., it has a smaller slope value) than in the low lightness range (i.e., which has a larger slope value)*."

ALLEN teaches a method of creating a <u>high resolution linearized halftone matrix</u>. As with COWAN, ALLEN also teaches the "first gamma correction" curve which is illustrated in **Fig. 6** as curve **602.** ALLEN cites, "to linearize the overall response of the printer to image data, the printer needs to apply a linearization characteristic illustrated by line 602 which <u>rectifies the density of ink actually printed to be the same as that instructed by the gray scale signal and to obtain an overall response corresponding to ideal response curve 603</u>"; **page 4, paragraph 66, lines 19 – 25.**

The characteristics of this curve are shown in a "linearization vector" **801** in **Fig. 8** (**page 5, paragraph 73, lines 1 - 2**). "A general form of the linearization vector would be a vector of 256 <u>16-bit elements</u>. Each element defines the number of dots to be 'turned on' at the halftone level corresponding to the index. For example, if the index 13 was

873, then 873 in the 8 bit threshold matrix would be at or below the threshold value of 13"; **page 6, paragraph 86.** Since the linearization vector has a 16-bit resolution, "*resolution in the high lightness range can be more enhanced than in the low lightness range*". As shown in **Fig. 8**, this "linearization vector" is used to produce a "low resolution, 8-bit threshold level matrix" **802**; **page 5, paragraph 71** and **page 6, paragraph 88.**

That is, the resulting halftone threshold matrix **802** linearizes the response (as shown in **Fig. 6**) for a given "gray level pixel value" (or COWAN's "color value"). The function of this resulting halftone matrix corresponds to the "*inverse gamma correction*" or "*second gamma correction*".

That is, ALLEN teaches the following limitations:

> ***said ink value data is defined so <u>as to decrease an ink quantity change rate in the high-lightness range than in the low-lightness range by a second gamma correction process so that resolution in the high-lightness range can be more enhanced than in the low-lightness range;</u>***
>
> ***and said half tone processing, <u>which represents gradations by a count of dots recorded per unit area, adjusts the count of dots, while taking into account a fractional portion, when an inverse gamma correction is applied</u>***

to said ink value data, the inverse gamma correction corresponding to the second gamma correction.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of ALLEN with those of COWAN, NEWMAN and JACOBS to enable one to generate a color conversion table so that colors output on one device would match those of a given printing device. JACOBS teaches the concept of matching colors between output devices while COWAN, NEWMAN and ALLEN teach the concepts of linearizing color output response with respect to an enhanced "linearization vector" when halftoning is performed.

As for claim 2, JACOBS *does not specifically teach* the color conversion table generating method according to Claim 1, wherein

said ink value data is defined by allocating the total number of gradations to part of the range of values of said ink recording rate.

COWAN teaches a correction for saturation in which "*ink value data is defined by allocating the total number of gradations to part of the range of values of ink recording rate*". COWAN cites, "To accomplish the correction of curve 402, the chroma value occurring at the point on curve 402 at which saturation begins is selected as the chroma value to map to the maximum color value (typically 255). The minimum chroma value … is selected to map to the minimum color value (typically 0). The chroma values

between the minimum chroma value and the chroma value mapped to the maximum color value are mapped to chroma values so that the resulting distribution of chroma value – color value pairs more closely approximate a line than the uncorrected chroma value – color value relationship”; **page 4, paragraph 36, lines 3 – 15.**

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of COWAN with those of JACOBS so that more colors could be represented and therefore, reproduced when saturation is present.

Regarding claim 7, JACOBS, COWAN, NEWMAN and ALLEN further teach a print controller which refers to a color conversion table generated by the method in claim 1and creates print data which indicates output images on the printing device from image data which indicates display images on the image device and causes a print operation to be performed.

Please see the discussion for claim 1.

Regarding claim 8, JACOBS, COWAN, NEWMAN and ALLEN further teach a color conversion table generator which generates a color conversion table according to the method defined in claim 1.

Please see the discussion for claim 1.

Regarding claim 9, JACOBS, COWAN, NEWMAN and ALLEN further teach a computer-readable medium with a color conversion table generating program recorded thereon to have a computer carry out a method for generating a color conversion table according to the method defined in claim 1.

Please see the discussion for claim 1.

As for claim 11, JACOBS teaches a correspondence definition data generating method wherein plurality of patches outputted from a printing device **[Fig. 2** color patches **32]**

are subjected to color measuring **[Fig. 2** spectrophotometer **36]**,

and a correspondence definition data **[Fig. 6** custom ink table **74]**

which defines a correspondence between color component values used in another image device **[Fig. 6** monitor model **22]**

and gradation values corresponding to ink quantities of inks used in the printing device **[Fig. 6** master ink table **70]**

is created based on a result of the color measuring, the method comprising:

creating patch data which specifies said plurality of ink quantities of inks with said gradation values

[“The printing device 12 receives a plurality of stepped ink values, such as CMY values, thereby to produce a collection 30 of color patches 32”; **col. 5, lines 33 - 36];**

printing said plurality of patches after performing halftone processing where said patch data is input and transformed into half tone image data which indicates a presence or absence of ink dots;

and generating said correspondence definition data based on color measuring data obtained by said color measuring of said plurality of printed patches

[“a spectrophotometer 36 … is utilized to measure the color value, in the selected colorimetric color coordinate system, of each color patch 32”; **col. 5, lines 47 - 51],**

wherein said patch data are so defined as to increase a number of patches in a low-lightness range than a number of patches in a high-lightness range by a first gamma correction process so that interpolation can be carried out with high accuracy in the low-lightness range;

said gradation values are so defined as to decrease an ink quantity change rate in the high-lightness range than in the low-lightness range by a second gamma correction process, so that resolution in the high-lightness range can be more enhanced than in the low-lightness range,

and said half tone processing, which represents gradations by a count of dots recorded per unit area, adjusts the count of dots, while taking into account a fractional portion, when an inverse gamma correction is applied to said gradation values, the inverse gamma correction corresponding to the second gamma correction.

However, JACOBS does not teach

printing said plurality of patches after performing halftone processing where said patch data is input and transformed into half tone image data which indicates a presence or absence of ink dots;

wherein said patch data are so defined as to increase a number of patches in a low-lightness range than a number of patches in a high-lightness range by a first gamma correction process so that interpolation can be carried out with high accuracy in the low-lightness range;

said gradation values are so defined as to decrease an ink quantity change rate in the high-lightness range than in the low-lightness range by a second gamma correction process, so that resolution in the high-lightness range can be more enhanced than in the low-lightness range,

and said half tone processing, which represents gradations by a count of dots recorded per unit area, adjusts the count of dots, while taking into account a fractional portion, when an inverse gamma correction is applied to said gradation values, the inverse gamma correction corresponding to the second gamma correction.

COWAN teaches a color calibration method. As shown in **Fig. 4**, COWAN teaches a method for linearizing an input color value (e.g., for cyan, magenta, yellow or black colorants) and cites, "applying correction to the relationship represented by curve 402 has the effect of reshaping curve 402 so that it more closely follows a linear relationship between the chroma value and the color value"; **page 4, paragraph 34, lines 1 – 4.** With respect to **Fig. 5A,** COWAN teaches a color calibration method for calibrating secondary colors which are combinations of primary colors (e.g., yellow and cyan, or yellow and magenta) in which a "hue gradient" (**page 5, paragraph 43, line 3**) is produced by "using a variable quantity of yellow colorant" (**page 5, paragraph 43, lines 5 – 6**) corresponding to "*color values ranging from 0 on the left side to 255 on the right side*"; **page 5, paragraph 43, lines 8 – 9.** COWAN further teaches that a "halftoning

operation may be performed upon the color values of the color planes to generate halftone data for the image. The halftone data includes binary data specifying for each of the pixels in each of the color planes whether colorant for that plane will be placed onto the pixel"; **page 2, paragraph 25, lines 7 – 12.**

That is, COWAN teaches the following limitation:

> ***<u>printing said plurality of patches after</u> performing halftone processing where <u>said</u> patch data is input and transformed into half tone image data which indicates a presence or absence of ink dots*;**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of COWAN with those of JACOBS and *print the plurality of patches after performing halftone processing* so that fine hue gradations could be produced and measured.

With respect to **Fig. 4**, COWAN teaches the construction of a "first gamma correction process" which "re-maps color values" and cites, "to perform the re-mapping, the color value associated with point 408 is re-mapped, in the table for the corresponding primary color, with the color value associated with point 410. As a result, an input of the color value associated with point 408 is, through re-mapping in the table, replaced by the color value associated with point 410. This re-mapping occurs over the range of chroma values present on curve 406"; **page 4, paragraph 34, lines 28 – 35.**

Although not shown in **Fig. 4**, the “re-mapping” produces a “first gamma correction” curve which would appear symmetrical to curve 402 with respect to curve 406. Although not relied upon for this rejection, this “first gamma correction” curve would have the shape of a “cut-back curve” as shown in **Fig. 7** of **US Patent 5,953,498** to **SAMWORTH**. The characteristic shape of this “first gamma correction” curve has a gentle slope for small color values (i.e., in the high lightness range) and a steeper slope for larger color values (i.e., in the low lightness range).

One of ordinary skill in the art at the time the invention was made would recognize that because of the steeper slope in the low lightness range, “interpolation accuracy” would decrease.

NEWMAN addresses this concern in teaching that the process of supplementing a color conversion table with additional points is well-known in the art. For example, NEWMAN teaches that “certain regions of a device’s color space are critical in the sense that good color reproduction is required (such as for flesh tones), or in the sense that large non-linearities occur even with small changes in device color coordinates. For such regions, it is desired to obtain more color patches <u>by decreasing the interval between samples, so as to obtain greater color accuracy and fidelity in these critical regions</u>”; **col. 1, lines 36 – 43.** NEWMAN cites a prior invention that adds data points “in regions of local non-

linearities" to "a look-up table based on empirically measured colors together with calculated colors that have not been measured"; **col. 1, lines 55 – 58.**

That is, regarding the following limitation, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of NEWMAN with those of COWAN and JACOBS to "*increase the number of patches in a low-lightness range than the number of patches in a high lightness range*" after a "*first gamma correction process*" so "*that interpolation can be carried out with high accuracy in the low-lightness range*".

> ***wherein said patch data are so defined as to increase a number of patches in a low-lightness range than a number of patches in a high-lightness range by a first gamma correction process so that interpolation can be carried out with high accuracy in the low-lightness range***

With respect to the "re-mapping" noted above, COWAN further teaches that after correcting for possible saturation (**page 4, paragraph 36, lines 1 - 10**), "each of the integer color values is assigned to correspond to the ejection of the number of drops (or fractional exposure of pixels on the photoconductor) necessary to result in a chroma value that lies closer to the line that connects the minimum chroma value and the chroma value at the maximum color value. This mapping is used to generate a table that includes pairs of values specifying the *number of drops of ink* (*or fractional*

exposure of pixels) that are to be ejected for each color value, for color values ranging from 0 to 255"; **page 4, paragraph 36, lines 15 - 25.**

That is, COWAN teaches that there is a "mapping" between "color values" and either "number of drops of ink" or "fractional exposure of pixels". As noted earlier, COWAN teaches that, in the case of an inkjet printer, the number of drops of ink is determined by a *halftoning operation*.

As noted, the "first gamma correction" curve with a "gentler slope" in the high lightness range and a steeper slope in the low lightness range, results in "*decreasing an ink quantity change rate in the high lightness range (i.e., it has a smaller slope value) than in the low lightness range (i.e., which has a larger slope value)*."

ALLEN teaches a method of creating a high resolution linearized halftone matrix. As with COWAN, ALLEN also teaches the "first gamma correction" curve which is illustrated in **Fig. 6** as curve **602.** ALLEN cites, "to linearize the overall response of the printer to image data, the printer needs to apply a linearization characteristic illustrated by line 602 which rectifies the density of ink actually printed to be the same as that instructed by the gray scale signal and to obtain an overall response corresponding to ideal response curve 603"; **page 4, paragraph 66, lines 19 – 25.**

The characteristics of this curve are shown in a “linearization vector” **801** in **Fig. 8** (**page 5, paragraph 73, lines 1 - 2**). “A general form of the linearization vector would be a vector of 256 <u>16-bit elements</u>. Each element defines the number of dots to be ‘turned on’ at the halftone level corresponding to the index. For example, if the index 13 was 873, then 873 in the 8 bit threshold matrix would be at or below the threshold value of 13”; **page 6, paragraph 86.** Since the linearization vector has a 16-bit resolution, “*resolution in the high lightness range can be more enhanced than in the low lightness range*”. As shown in **Fig. 8**, this “linearization vector” is used to produce a “low resolution, 8-bit threshold level matrix” **802**; **page 5, paragraph 71** and **page 6, paragraph 88.**

That is, the resulting halftone threshold matrix **802** linearizes the response (as shown in **Fig. 6**) for a given “gray level pixel value” (or COWAN’s “color value”). The function of this resulting halftone matrix corresponds to the “*inverse gamma correction*” or “*second gamma correction*”.

That is, ALLEN teaches the following limitations:

> <u>***said gradation values are so defined as to decrease an ink quantity change rate in the high-lightness range than in the low-lightness range by a second gamma correction process, so that resolution in the high-lightness range can be more enhanced than in the low-lightness range,***</u>

> ***<u>and said half tone processing, which represents gradations by a count of dots recorded per unit area, adjusts the count of dots, while taking into account a fractional portion, when an inverse gamma correction is applied to said gradation values, the inverse gamma correction corresponding to the second gamma correction.</u>***

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of ALLEN with those of COWAN, NEWMAN and JACOBS to enable one to generate a color conversion table so that colors output on one device would match those of a given printing device. JACOBS teaches the concept of matching colors between output devices while COWAN, NEWMAN and ALLEN teach the concepts of linearizing color output response with respect to an enhanced "linearization vector" when halftoning is performed.

As for claim 12, JACOBS *does not specifically teach* the correspondence definition data creating method according to Claim 11, wherein

> **said gradation values corresponding to ink quantities are defined by allocating <u>the</u> total number of gradations to part of the range of value of ink recording rate.**

COWAN teaches a correction for saturation in which "*ink value data is defined by allocating the total number of gradations to part of the range of values of ink recording*

rate". COWAN cites, "To accomplish the correction of curve 402, the chroma value occurring at the point on curve 402 at which saturation begins is selected as the chroma value to map to the maximum color value (typically 255). The minimum chroma value … is selected to map to the minimum color value (typically 0). The chroma values between the minimum chroma value and the chroma value mapped to the maximum color value are mapped to chroma values so that the resulting distribution of chroma value – color value pairs more closely approximate a line than the uncorrected chroma value – color value relationship"; **page 4, paragraph 36, lines 3 – 15.**

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of COWAN with those of JACOBS so that more colors could be represented and therefore, reproduced when saturation is present.

Regarding claim 18, JACOBS, COWAN, NEWMAN and ALLEN further teach a print controller which refers to a correspondence definition data <u>created by the method of claim 11,</u> *which defines a correspondence between ink value data which specifies ink quantities of inks used in a printing device and color component values used in another image device* and creates print data which indicates output images on the printing device from image data which indicates display images on the image device and causes a print operation to be performed.

Please see the discussion for claim 11.

Response to Arguments

12. Applicant's arguments with respect to all claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- **U.S. Patent 5,818,604 A [DELABASTITA et al.]**
- **U.S. Patent 6,575,095 B1 [MAHY et al.]**
- **U.S. Patent Application 2003/0002058 A1 [COUWENHOVEN et al.]**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter L. Cheng whose telephone number is 571-270-3007. The examiner can normally be reached on MONDAY - FRIDAY, 8:30 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, King Y. Poon can be reached on 571-272-7440. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/King Y. Poon/
Supervisory Patent Examiner, Art Unit 2625

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